Lawrence Berkeley National Laboratory
Integrated Safety Management
Peer Review

February 10, 2006
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Disclaimer

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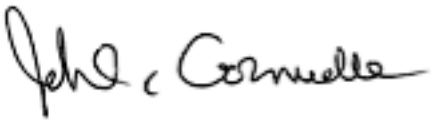

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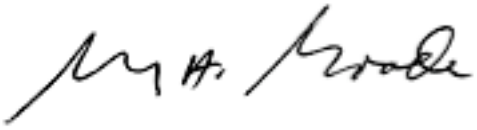

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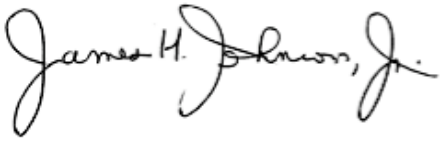

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List of Acronyms

AHD	Activity Hazard Descriptions
ALS	Advanced Light Source
BSO	Berkeley Site Office
CATS	Corrective Action Tracking System
DART	Days Away, Restricted, or Transferred
DOE	Department of Energy
EH&S Division	Environment, Health and Safety Division
ES&H	Environment, Safety and Health
HPI	Human Performance Improvement
IA	Incident Analysis
IFA	Integrated Functional Appraisals
ISM	Integrated Safety Management
JHQ	Job Hazard Questionnaire
LBNL	Lawrence Berkeley National Laboratory
MESH	Management of Environment, Safety and Health
MSD	Material Science Division
NNSA	National Nuclear Security Administration
PI	Principal Investigator
PRD	Performance Review Document
RSC	Radiation Safety Committee
SA	Self-Assessment
SME	Subject Matter Expert
TRC	Total Reportable Injury Case
WOW	Workers Observing Workers
ZAP	Zero Accident Program

Executive Summary

A Peer Review Committee (the committee) was convened from January 17, 2006 through January 20, 2006 by the University of California to review the status of Integrated Safety Management (ISM) at the Lawrence Berkeley National Laboratory (LBNL) and to evaluate a few specific issues. The committee interviewed a wide sampling of the LBNL population and visited a representative set of work areas. As part of the review, a careful analysis of the LBNL Total Reportable Injury Case (TRC) and Days Away, Restricted, or Transferred (DART) data was done and is reported in a separate section. The committee made 54 Suggestions related to 24 identified Issues. Additionally, 7 Positive Observations were made with 8 Suggestions for further improvement.

Overall, the committee was impressed with the safety attitude of all interviewed and the proactive character of both the leadership and the staff of the Laboratory. The character of the activities at the Laboratory presents a wide variety of challenges for the implementation of a structured program and those challenges have been successfully met within many parts of LBNL.

Perhaps the greatest challenge for LBNL will be incorporating the outstanding peer review culture that the Laboratory exhibits in its scientific and technical work and into its operations activities, including Environment, Safety, and Health (ES&H). Excellence in all aspects of the work at LBNL can be achieved just as it has been in science and technology.

Background

The committee was tasked by Ron Nelson of the University of California in his letter of January 5, 2006. (Appendix A)

The committee consisted of the following individuals:

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The tasking letter presented the Purpose and Scope as follows:

> ***"1.0 Purpose***
>
> *The Berkeley Lab is conducting an Environment, Safety and Health (ES&H) peer review with the aim of improving the operations, implementation and Lab-wide execution of a robust Integrated Safety Management (ISM) system. The Lab is requesting the review at this time because a number of leading indicators are present that may indicate our execution of ISM is not as effective as it was a few years ago. Those leading indicators include:*
>
> - *Missing our TRC and DART goals for 2005*
> - *Laser safety issues regarding the laser inventory and the correct use of laser interlock systems*
> - *An apparent breakdown of administrative safety controls at the Advanced Light Source (ALS)*
> - *Communication breakdowns between the Berkeley Site Office (BSO) and the Environmental, Health and Safety (EH&S) Division.*
>
> *The peer review is designed to identify root causes for these leading indicators, identify any specific deficiencies in the Laboratory's implementation of ISM and make any specific recommendations for improvement the Peer Review Committee may judge necessary and appropriate. Although the Committee may identify any best practices they observe, that is not the primary purpose of this review.*
>
> ***2.0 Scope***
>
> *The scope of this review is to use the core requirements of ISM to assess the Berkeley Lab's adherence to ISM guiding principles. In addition, a program elements scoring matrix is available as a guide. The review is being chartered by Dr. Steven Chu, Laboratory Director.*
>
> *This peer review should be conducted by:*
>
> - *Using the expert knowledge of its Committee membership*
> - *Using a graded approach appropriate to the hazard level of the work*
> - *Validating implementation of ISM Principles*
> - *Using document review, facility walk-throughs and observations, and personnel interviews"*

It further restated the 7 ISM principles summarized here:

1. Line Management Responsibility for Safety

2. Clear Roles and Responsibilities

3. Competence Commensurate with Responsibilities
4. Balanced Priorities
5. Identification of Safety Standards and Requirements
6. Hazard Controls Tailored to Work Being Performed
7. Operations Authorization

The above tasking letter specifically tasked the review committee in the following way:

"At a minimum, ES&H program aspects that require special attention in this review are:

- *Adequacy of administrative and engineering controls at the Advanced Light Source*
- *Adequacy of the laser safety program*
- *The quality of Laboratory leadership regarding ES&H*
- *The effectiveness of the principal investigator, middle managers and first line supervisors as safety leaders and mentors at the Berkeley Lab for example frequency of walk-throughs and mechanisms for addressing employee safety concerns.*
- *The state of the "safety culture" at the Berkeley Lab, evaluated by considering whether the following statements are generally true or not true as descriptions of the Berkeley Lab culture:*

  1. *Unsafe practice is considered unacceptable*
  2. *Everyone feels responsible for safety*
  3. *People go out of their way to identify unsafe conditions and behaviors*
  4. *People intervene to correct unsafe behavior*
  5. *Reminding someone to work safely is appreciated at the Berkeley Lab*
  6. *Safe work practices are supported with rewarding feedback from Principal Investigators (PIs) and operations managers*
  7. *Root causes are determined for all adverse events, and analyzed for opportunities to improve the system*
  8. *ES&H is NOT just a priority; it is an integral part of what the Berkeley Lab does."*

Methodology

The committee met for three and a half days culminating in an out-brief with the Laboratory Director, his Deputy and members of the LBNL staff as well as representatives from the University of California and the three Department of Energy (DOE) observers mentioned in Appendix A.

During the three days of interviews and work area visits, the committee interviewed the following individuals and groups:

- Director Steven Chu
- David McGraw
- Material Science Division (MSD) Director
- Fire Marshal
- Engineering Machine Shop and Plating Shop
- Engineering Division Director
- Facility Division Director
- General Science Division Directors
- Waste Management Group Leader
- Electrical Safety Engineer
- Members of the following work groups:
  - Industrial Hygiene
  - Occupational Safety
  - Health Services
  - Emergency Operations
  - Radiation Protection
  - Waste Management
  - Engineering Services
  - Training
  - Office of Contract Assurance
  - Safety Review Committee
  - Division Safety Coordinators
  - EH&S Division Liaisons
  - Post Doctoral Fellows
  - ALS Management
  - Bioscience Center
  - MSD Facilities
  - Hazardous Waste Handling facility
  - Causal Analysis Committee for electrical safety incidents
  - Chair, ALS Investigation Committee
  - Industrial Hygiene (Laser Safety)
  - Department of Energy (DOE)/National Nuclear Security Administration (NNSA)/ Berkeley Site Office (BSO)
  - Berkeley Lab Institute

Observations

The entire staff of LBNL was willing to discuss issues at length. The committee members often met with individuals spontaneously or on very short notice and were met with openness and engaging discussion. The focus of all staff interviewed was on improvement and concern for safety. There was also a great deal of concern on the part of the staff that work would be curtailed if safety goals were not met. More discussion of this appears below in the Issues section. It is mentioned here because of its prevalence across the organization.

The sections below expand on the observations that were made by the committee. Observations that were viewed as suggesting the need for improvement are listed in the section titled Issues. These are grouped by the 7 Principles of ISM for convenience and to help structure the discussion. A few of the Issues did not lend themselves to this organizational structure and were put into an "Other" category.

Similarly, several observations were viewed as very positive. These are presented below in the Positive Observation category with suggestions on how they can be utilized more broadly to further strengthen LBNL.

Finally, a more extensive review of TRC and DART data was done and is presented in its own section with Issues and Positive Observations described in the TRC Injuries and Hazard Identification and Mitigation sub-sections.

Issues

1. *Principle 1 - Line Management Responsibility for Safety:*
   Line management is directly responsible for the protection of the public, the workers, and the environment.

1.1. There are indications that line management including the PIs generally understand their responsibilities for the safety of their employees and operations. However, there appears to be weaknesses in execution of their responsibility.

Discussion

- PIs do not appear to be well trained/prepared for their line management responsibilities.
- The span of control for a PI can exceed what is easily manageable making it even more difficult to monitor their spaces and activities.
- Presence of senior management walking the work area is spotty. The senior management walk-arounds of the work area varies from once a year to twice a day. The institutional expectation is that senior managers inspect all of their staff workspaces annually, which is insufficient oversight for many work activities. Discussions with the workforce confirm the positive impact the presence of senior management in the laboratories has in reinforcing the premise that management is interested in them and their safety.
- In some areas, technical safety experts are only seen when there is a problem. A very positive exception to this rule is in MSD where a very strong individual has constant presence in laboratories and is viewed as a strong resource.
- Management's communication of issues related to safety to the rank and file is not effective.
- Based upon a random sampling of performance review documents (PRDs), the majority of the comments regarding performance in the area of ES&H were perfunctory and contained little qualitative measure of performance.

Suggestions

1.1.1. Develop a training program for PIs to prepare them for their line management responsibilities.
1.1.2. Look into ways of reducing the span of control for PIs by recognizing Post Docs as supervisors and in turn training them for these responsibilities.
1.1.3. The job responsibilities of the technical safety experts should be expanded to include the obligation to walk the laboratories, observe conditions and to teach PIs how to conduct effective walk-arounds.

1.1.4. Explicitly reinforce to management the very positive impact of their presence "on the floor" and the value of increased time spent in this activity.
1.1.5. Carefully review the implications of phrases used in the reinforcement of ISM at LBNL so that the possibility of misinterpretation can be minimized (e.g., "Unsafe behavior is antisocial behavior").
1.1.6. Introduce quantitative ES&H performance measures for supervisors.
1.1.7. Move the ES&H performance question to the beginning of the PRD.

2. *Principle 2 - Clear Roles and Responsibilities:*
Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organized levels within the department and its contractors.

2.1. It is not clear how senior management is assured of an independent review of ES&H programs and work activities within divisions.

Discussion

- In the crafts at LBNL, work observations and inspections are sometimes perceived as punitive and therefore actively resisted.
- Documentation provided by division ISM plans and division self-assessment plans reflect an uneven consideration of safety from one division to another.
- EH&S Division is not adequately consulted when (renovated or new) facilities are planned.
- The role of the safety coordinator varies across LBNL.

Suggestions

2.1.1. Continue to reinforce that peer review activities are for continuous improvement and train inspectors in the craft areas to communicate in a positive, self-help manner.
2.1.2. Consider a more detailed and consistent set of position descriptions with respect to ES&H responsibilities of line management and the ES&H support staff across the Laboratory.
2.1.3. Assure that ES&H concerns are not only considered in normal operations but also in facility modification and construction explicitly.

2.2. Lack of stability in the EH&S Division management has created the atmosphere that work in the division is not understood or appreciated.

Discussion

- There have been three division leaders in three years.

Suggestion

2.2.1. As quickly as possible, stabilize the EH&S Division leader position.

2.3. Some workers may view statements like "Each employee is responsible for his or her own safety" and "Unsafe behavior is antisocial behavior" as a way to assign blame to the worker in the event of an accident.

Discussion

- This is not an idle concern. In our own institutions and in the news we have all observed blame and punishment put on workers involved in accidents that "were waiting to happen" because of working conditions or de facto accepted work practices.
- Some LBNL workers expressed feeling trapped by this responsibility because they have no effective way to change unsafe working conditions or practices.

Suggestions - If this is determined to be a significant issue at LBNL:

2.3.1. Confront this issue in communications with employees and make clear management's dedication to fairness and expectation of employee responsibility.
2.3.2. Ensure that each employee has an effective way to discharge his or her responsibility for safety. This should include a way to provide feedback or seek assistance on workplace safety matters, and if the employee feels the need to do this without going through his or her line of supervision.

3. Principle 3 - Competence Commensurate with Responsibilities:
Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.

3.1. There is not a uniform, laboratory-wide way to educate leaders, managers, and supervisors on how to make safety an integrated part of the activities in the workplace.

Discussion

- It is not clear that all line managers are trained to conduct meaningful safety walk-arounds.
- The minimum qualifications and training of safety coordinators should be determined and formalized.
  - Safety coordinators are the primary implementers of the LBNL safety program, and some evidence indicates that the quality of the safety program is directly related to the quality of the safety coordinator.
  - There are only two required courses for safety coordinators and no other qualifications have been formalized.

- Safety coordinators are the "gatekeepers" to the involvement of ES&H subject matter experts (SMEs).

Suggestions

3.1.1. Provide mentoring assistance for all lead managers who are expected to walk their workspaces.
3.1.2. Use the Berkeley Lab Institute to develop a required core set of courses for all Laboratory leadership, managerial and supervisory positions.
3.1.3. The qualifications and training for the safety coordinator position should be determined and formalized, similar to the program for the safety liaisons.

3.2. Work pressures could be driving people to work in less safe ways, causing mistakes, or creating stressed personal interactions.

Discussion

- In the absence of information, assumptions are being made regarding the relative value of the work being done resulting in risk acceptance that may not be what is intended.
- Some employees suggested that supervisors had to approve their time away from work to attend counseling sessions, thus making it known that they were attending these sessions.

Suggestions

3.2.1. Assure that all employees understand counseling availability and that any barriers for its use (supervisor approval for time off) are minimized.
3.2.2. Make clear statements from all levels of leadership that **schedule is always second to safety** and have management actions reflect this philosophy.

3.3. Causal analysis is inconsistently applied and may not result in corrective actions that will prevent recurrence.

Discussion

- Root cause determination is only required for serious incidents.
- The root cause analyses performed for the 15 electrical incidents and the 50 OSHA recordable cases did not result in any formal corrective or preventive actions.
- It was not apparent that corrective actions for lower level incidents are tracked to closure.
- Technical people without causal analysis expertise lead root cause analyses.

Suggestions

3.3.1. Consider lowering the thresholds for root cause analysis in the ES&H causal analysis procedure and making it a lab-wide requirement.
3.3.2. Consider developing in-house causal analysis/root cause analysis expertise that is available as needed.
3.3.3. Require that all root cause analysis include corrective and preventive actions that are tracked to closure in the Laboratory's Corrective Action Tracking System (CATS).
3.3.4. Challenge the management and staff with the notion of "all accidents are preventable." If the institution can agree to this notion, consider investigating all incidents for underlying causes/latent organizational weaknesses.

4. *Principle 4 - Balanced Priorities:*
Resources shall be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers, and the environment shall be a priority whenever activities are planned and performed.

4.1. Even though there is a very proactive approach in many elements of LBNL, the widespread perception is that the Laboratory is in a very reactive posture with respect to ES&H.

Discussion

- Significant portions of the staff believe that improvements do not occur unless there is a serious problem. Interviews with supervisory and non-supervisory employees disclosed their concern that "someone had to get hurt" before a safety problem would get fixed.
- Staffing in many support groups has dropped below levels that allow high quality support.
- Employees see safety as a lower priority to "production" because of cuts in safety staff and safety issues that remain unfixed.
- ES&H-type employees described their inability to provide adequate coverage because of the lack of staff.
- The professional safety staff currently has no time to participate with the scientific staff in the planning of new experiments or facilities. Safety and the minimization of hazardous waste generation is thus reduced to an after thought rather than designed in from the beginning.

Suggestions

4.1.1. Management needs to seriously look into ES&H resources and communicate to the employees the rationale for their funding decisions.

4.1.2. Share proactive experiences more widely. Make lessons learned a standard element of staff/group meetings and develop more effective mechanisms to share between divisions/work groups.
4.1.3. Management should review the current staffing levels in radiation, environmental, and industrial safety to more closely match the staffing levels with the group responsibilities and the management's expectations for improved programs.

4.2. The excessive focus on the DART and TRC rates has negatively impacted the safety program.

Discussion

- The employees fear that any reported accident will have serious implications for LBNL, their division, their laboratory and possibly their job. The loss of this accident information has negatively impacted the Laboratory's safety leading indicator program and thus the ability to implement programs specific to correcting deficiencies in the current program.
- The need for upper management review of all injuries produces an underground mentality because of the concern employees have with the use of the information. This would not be a problem if employees trusted the management to use the information to truly improve safety.

Suggestions

4.2.1. Use the safety coordinator in each division as a trained advisor to assure consistent reporting by line management.
4.2.2. Provide clear training for the safety coordinator for decision-making.

4.3. Mentoring of leadership PIs on operational issues does not get the same attention as the technical issues and the span of control for these leaders makes their jobs excessively challenging.

Discussion

- PRDs are thorough for technical work content and superficial on operations.
- PIs can have as many as 30-50 people in a research group.
- Division directors can have as many as 70 PIs in as many as 16 facilities in addition to his/her own research group.
- The span of control for many leaders is beyond what can be expected to produce good results. Leaders are driven to choose between safety activities and schedule. When time is an issue, product and schedule are seen as more important than safety expectations.

Suggestions

4.3.1. For leaders and managers, reexamine how many direct reports are reasonable to assure quality in all areas of responsibility.
4.3.2. Develop a training program for PIs to prepare them for their line management responsibilities. (See 1.1.1.)

5. *Principle 5 - Identification of Safety Standards and Requirements: Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards and requirements shall be established which, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences.*

5.1. It is not clear that activity hazards that are below the threshold or not the primary subject for Activity Hazard Descriptions (AHDs) are adequately analyzed and controlled.

Discussion

- We observed a laser experiment that had an AHD that addressed the laser hazards but did not address the high voltage, toxic gas, and chemical hazards.

Suggestions

5.1.1. Consider lowering the threshold for preparing AHDs and include all significant hazards of the work activity in the AHD.
5.1.2. Reconsider your standards for compressed gas usage in laboratories relative to the need for detectors (e.g., hydrogen).

5.2. Subcontractors seem to be held to a lower safety standard.

Discussion

- For the sake of contract worker's safety, the reputation of LBNL, and the morale of LBNL craft employees, it is important to "level the playing field" regarding ES&H implementation rigor at LBNL. Holding subcontractors to a lower standard or simply not enforcing the standards has several negative impacts:
  - It undermines credibility of active program.
  - It makes on-site crafts uncompetitive.
  - It introduces hazards in an unacceptable way.

Suggestion

5.2.1. Assure that when a subcontractor is on the LBNL site, the LBNL ES&H standards are enforced.

5.3. Work Planning: The work authorization process is not well suited to project/maintenance type work.

Discussion

- The building 58 electrical incident could have been prevented if a more thorough hazard identification process were used.
- The "Project Report" for this incident is not a "worker-friendly" format and is not comprehensive.
- The "Task Hazard Analysis" form used by maintenance workers was perceived by ~30% of the group as protecting the LBNL from lawsuits, not protecting them.

Suggestion

5.3.1. Consider forming a work group of operations staff, workers, and EH&S Division personnel to develop a work permit process suited to project/maintenance work.

6. Principle 6 - Hazard Controls Tailored to Work Being Performed: Administrative and engineering controls to prevent and mitigate hazards shall be tailored to the work being performed and associated hazards.

6.1. Safety is not a multi-layered redundant consideration in all divisions: some hazard controls do not allow for human error.

Discussion

- Some controls seem to be based on the premise that no human error will occur. This places unreasonable expectations on the workers and sets them up for failure.
- For example, critical administrative controls at the ALS depend on operator memory and/or logbook entry. A requirement to tag a safety system key with the reason(s) for a lockout is a simple "operator aid" that provides backup for the operator. It also places the information where and when it is needed, a useful concept.

Suggestion

6.1.1. Investigate incidents (major, minor, and near-hits) looking for underlying organizational weaknesses. Develop a hazard analysis process that recognizes human error and provide for controls that allow for human mistakes.

6.2. The recent series of shielding control incidents at the ALS indicates that administrative control of shielding and interlock systems is not adequate.

Discussion

- At the ALS, radiation protection depends almost entirely on interlocks and configuration control of shielding.
- The January 2006 report by the LBNL Radiation Safety Committee (RSC) documents lapses in the control of the shielding and interlocks.
- The RSC report provided a comprehensive review of the problems that led to these lapses and put forth recommended solutions.
- A majority of the report recommendations are prescriptive in nature. However, as good management practice, the actions needed to correct the deficiencies must be devised and owned by ALS and LBNL line management.
- The varied and constantly changing research activities at light source facilities require robust administrative controls to ensure safety.

Suggestions

6.2.1. The analysis in the RSC report should be accepted as the product of expert knowledge. The corrective actions should be the product of and responsibility of line management.
6.2.2. Consider drawing on the experience at other light source facilities to assist in developing enhanced administrative controls.
6.2.3. Consider adopting the principles of Conduct of Operations to provide structure and discipline in the oversight of research and operations activities on the ALS experimental floor.

6.3. Facility Inspection program is variable in frequency and effectiveness and is not identifying and correcting hazards in a timely fashion.

Discussion

- The Director's walk-through identified poor housekeeping, outdated safety contact lists, water leaks and other concerns that indicated a potential for creating a serious hazard. This resulted in a shutdown of the individual PI's laboratories.
- LBNL staff told us that the LBNL requirement for facility inspection was once per year, and that some organizations do just that, while others inspect their facilities much more frequently. One division director, in the presence of two other division directors, verbally stated this institutional expectation to a subset of the committee. No director disputed the accuracy of the statement. See also issue 1.1, discussion point 3.
- The inspection protocols do not require involvement of PIs or appropriate SMEs.

Suggestions

6.3.1. Consider revising the facility hazard inspection program frequency and team makeup consistent with the graded approach.
6.3.2. Consider having teams periodically inspect other division's workspaces to get the "fresh set" of eyes.

6.4. Recent inspections and reviews have identified shortcomings in laser safety.

Discussion

- About a year ago a DOE directive was issued identifying laser issues system wide. In late 2005, a DOE verification of the LBNL response to these issues turned up problems in laser inventory and interlock controls. An action plan to correct these discrepancies is due for completion on April 17, 2006.
- During the last several years, responsibility for laser safety was moved to Occupational Safety, then to Radiation Protection, and in 2006, back to Industrial Hygiene. The Laser Safety Officer recently resigned and a search is underway for a replacement. In the meantime, individuals on loan from other institutions have filled this function.
- The use of lasers at LBNL is widespread, in a variety of settings and with many different types of lasers.

Suggestion

6.4.1. Organizational stability in the laser safety program should be established as soon as possible. In the meantime, enhanced management attention to resources and oversight may be in order to ensure that program goals are met.

7. *Principle 7 - Operations Authorization:*
The conditions and requirements to be satisfied for operations to be initiated and conducted shall be clearly established and agreed-upon.

7.1. There is no laboratory-wide work control program aimed at work planning and coordination for routine maintenance and project work.

Discussion

- Formal work control including planning and permitting provides a means for including ES&H controls in all routine maintenance and other work that supports the LBNL mission. This is safety integration at a basic level.
- Work control enhances proactive resolution of ES&H and work coordination issues in an environment of complex laboratory activities.

- Safe work authorization (Chapter 6 of Publication 3000) is a necessary program but is initiated only after ES&H issues have been identified and hence is not at the basic level of Integrated Safety Management.
- There is not a work planning process laboratory-wide of the kind that is in place in the Facilities Division – i.e., a process that is used even if no high hazard issues are identified.
- A uniform work control program could be used at the division level for in-house and outside contractor work.

Suggestion

7.1.1. Consider instituting a uniform work control program that is accessible at the division and activity level to provide the benefits of work planning in furthering ISM and in the resolution of work conflicts.

7.2. The requirement to keep the AHD personnel list current is not clear.

Discussion

- Personnel lists in the AHDs are not all current and some PIs were not clear what was required.

Suggestion

7.2.1. Clarify the requirement for personnel listed on the AHD (always current, updated yearly, etc.) and include a review of these documents during the Self-Assessment (SA) process.

8. Other
A few of the Issues identified did not lend themselves to inclusion in the principles list but are captured here.

8.1. There are no ES&H performance measures or performance metrics that can be considered "leading indicators" for each division.

Discussion

- What gets measured gets done. Performance metrics tied to safety processes help define ES&H expectations and can lead to better overall ES&H performance.
- Choosing appropriate leading indicator metrics is not intuitive.

Suggestions

8.1.1. Develop leading indicator metrics for each division to be included in the ISM plan.

8.1.2. Consider benchmarking with other companies to help develop the metrics suggested in 8.1.1.
8.1.3. Formally require a report of the analysis of the leading indicators semi-annually.

8.2. The SA process may not be serving the intended purpose.

Discussion

- Division SA content/formality varies widely.
- Division SA roll-up may not be telling management what they need to know. Evaluation criteria need more senior management attention and strategic focus.
- The SA evaluation criteria development process is not aligned with LBNL strategic objectives.
- Integrated Functional Appraisals (IFAs) by SMEs are vertical reviews as are Management of Environment, Safety, and Health (MESH) reviews; there is no process to focus independently on a program across the Laboratory (horizontal).

Suggestions

8.2.1. Establish a standard format for division SA plans with a minimum required content.
8.2.2. Consider changing the IFA to focus on specific program elements horizontally across divisions.
8.2.3. The SA evaluation criteria development process should be aligned with LBNL strategic objectives.

8.3. Individuals at BSO believe that the Laboratory only shares information it has to and does not trust the DOE (site office, HQ, etc.).

Discussion

- The BSO notes very late notifications.
- LBNL does not give the BSO information it needs to support the LBNL.
- This reinforces feeling of distrust (both DOE and LBNL).

Suggestions

8.3.1. Remind all employees of Director's commitment to the open communication protocol and why that is important.
8.3.2. Address impact of focus on statistics directly with highest levels in DOE HQ.

8.3.3. Broadly introduce Human Performance Improvement (HPI) concepts. Which will encourage reporting so that the institution can learn from its mistakes.

Positive Observations

A. Employee Commitment

A.1. The personal safety philosophy as expressed by the employees has begun to evolve into one of "we are responsible for each others safety."

Suggestion

A.1.1. This philosophy should be promulgated up and down the line management and be reinforced and publicly expressed by senior management.

A.2. Staff at all levels is extremely committed to the success of the institution and are ready to do what is necessary to achieve it.

Discussion

- The Director, Dr. Chu, has an exceptional standing with staff and as such is in a position to affect the kind of change he wants.

Suggestion

A.2.1. Use this "personal capital" to drive the kinds of behaviors you want from staff. Model the behavior you want and expect it from all managers.

B. ES&H Approach

B.1. The shift to a more customer-oriented approach is noticed and appreciated.

Suggestion

B.1.1. Continued reinforcement will allow the teams to better accept the restrictions that are often necessary.

B.2. The combination of MESH, IFA, and division SAs bring all viewpoints to the table for discussion.

Suggestions

B.2.1. Strengthen by leading the effort to more effectively incorporate walk-arounds.
B.2.2. Develop an effective integration of the three tools at the division level.

B.3. The peer-to-peer observation program, Workers Observing Workers (WOW), in the facilities division has produced a positive safety culture amongst the participating employees.

Discussion

- The WOW program appears to be a successful culture changing activity.
- Supervisors don't always support this activity because of schedule pressures.
- Supervisors may resist because they view WOW as a critical review and an encroachment on their prerogatives.
- Employees question whether supervisors really value their efforts in the WOW program.
- Properly implemented this type of program has potential for success throughout the LBNL.

Suggestions

B.3.1. Employees suggested that work tickets be written to conduct WOW observations. This appears to be a good way of acknowledging that this is a valued activity.

B.3.2. Consider developing a total observation program for supervisory and WOW supervisory employees similar to the WOW program that is tailored to each division's needs.

C. There are strong ES&H practices

C.1. The ALS inspects all equipment brought on site by guest researchers for safety issues.

Discussion

- The light source facility is unique at LBNL in the number of guest researchers it has per year. All of the special equipment brought on site undergoes a safety inspection and if necessary, is modified at ALS expense to make it safe. This is a major positive feature in the ALS safety program.

Suggestion

C.1.1. To the extent that such a program is applicable elsewhere within LBNL, it should be implemented.

TRC and DART Analysis

Scope

The performance of LBNL on TRCs and DARTs, a key metric for the Office of Science, has been short of the established targets. The 50 TRC injuries for FY05 were reviewed, including a substantial amount of analysis performed by LBNL on this TRC data. The Laboratory's process for analyzing injuries and reporting on them were also reviewed. The Laboratory's approach to the five core functions of ISM was studied, especially as they pertain to the kinds of injuries that occurred in FY05. This is based on the presumption that most if not all injuries are tied to some failure of one of the core functions (or possibly one of the guiding principles). Several safety coordinators and other division staff were also interviewed to obtain their views of the strengths and weaknesses of the existing system.

Almost all the TRC injuries occurred during what would be termed "low hazard" activities, so the notes below apply in general to these kinds of tasks only. These observations are not intended to apply, for example, to the handling of radiation sources, chemicals, or Class 4 lasers.

9. TRC Injuries

Summary

There were 50 TRC injuries in FY05 for the Laboratory. This resulted in a TRC rate of 1.7 versus the goal of 1.17 for the Laboratory. On the order of 75% of these injuries fell into three types of injuries – slips, trips, and falls; repetitive motion; and material handling.

C.2. Positive Observation – The TRC data has been thoroughly analyzed by both LBNL and outside experts. These analyses have been presented at various forums and in many ways.

Discussion

- Long-range trending of the TRC data shows that the trend is steadily declining. A statistical review performed by a Stanford Professor who is a specialist on small sample sizes indicates that there is a fair amount of randomness in the injury statistics, so that the observed TRC rate may not be a good indicator of the fundamental health of the ISM program.

9.1. Issue - The TRC rate is higher than the Office of Science goal, and the goal drops significantly to .65 in FY07.

Discussion

- While the TRC goal is very aggressive, other National Laboratories show a lower TRC rate than LBNL, so that not taking additional action at this time is probably not acceptable.
- A thorough and unique review of the 50 FY05 TRC cases was performed by a Task Force and presented to the Laboratory by Matt Kotowski and Mike Ruggieri on January 9, 2006. The raw data for this is a six-page listing that describes each injury and the circumstance(s) that drove the selection of the root cause. While the abstracted statistical data seems to offer little of value, the raw data is very insightful and suggestive. For example, it shows that almost every injury is an unsafe behavior, not an unsafe condition. It shows that often the communication between the supervisor and injured party could have been improved. It shows that often the hazard analysis and hazard mitigation core function steps (steps #2 and #3) could have been improved. In short, it offers the hint that many of these injuries possibly were preventable.

Suggestions

9.1.1. The raw TRC data should be widely disseminated to, at a minimum, every supervisor/manager and safety professional. The top management of LBNL should also make time to read this, since it is distilled, condensed, and rich with valuable lessons. The recommended perspective should be "what could we have done differently to have prevented this injury from occurring?"

9.1.2. The Engineering Division has just initiated a program emphasizing the five ISM core functions plus two other ISM statements – "Each employee is responsible for ensuring his or her own safety" and "I am responsible for safety". This focus speaks directly to many of the root causes of TRC injuries during FY05. The Laboratory should consider adopting this program/emphasis or perhaps one such as "Taking personal and collective responsibility for safety" across the site. Combining this with Suggestions 2.3.1, 3.2.2, 3.3.4, and 6.1.1 above, the LBNL message will be consistent and positive.

10. Hazard Identification and Mitigation

For "self-authorized" work, the basic hazard analysis document is the Division ISM Plan. This must be completed once per year or when the individual's duties significantly change. There are approximately 200 questions, and a positive answer will create a training requirement, which is tracked in the system. Some work orders have a built-in hazard analysis checklist. The Facilities Division has a program called Zero Accident Program (ZAP). They must fill this hazard analysis form out before they do the job, and turn the form in with any lessons learned following the completion of the job. Other similar systems may exist within the Laboratory.

Chapter 6 and its appendices in Publication 3000 describe the work authorization process. If a staff member's work does not cross any of the thresholds identified in this Chapter, then the staff member is self-authorized to perform their work on their own. Most all of the TRCs occurred during work that was self-authorized.

10.1. For "self-authorized" light lab work, which is where most all the TRC injuries come from, there is no formal document or process that demands that every employee on an annual or periodic basis assess all of the hazards that they are likely to face in their job, and describe the hazard controls/mitigation which they will utilize to defeat the hazards. Falling back to the old saying "it's the planning, not the plan", requiring each staff member to do this will make the hazard identification and mitigation steps of ISM personal and hopefully memorable.

Discussion

- The Job Hazard Questionnaire (JHQ) determines the training needed for particular types of work. However, much of the light work at the Laboratory does not require much more than the *Introduction to EH&S at LBNL* and *Ergonomics for Computer Users*. While lifting/material handling injuries are common, the training is only recommended (not required) if the staff member "lifts, twists, or carries objects as part of their routine work assignment". All of this training is taken once, and after a period of time will certainly wear off for the average staff member. None of the 50 TRC injuries in FY05 referred to a training deficiency as a root cause.

Suggestion

10.1.1. Consider instituting a formal system required of every staff member to identify their own personal set of hazards and hazard mitigation actions. It would be helpful to have the supervisor sign off on this, so that hazard mitigation that needs institutional assistance can be recognized. This suggestion is closely related to 5.1.1 above.

Summary

We have addressed the issues put to us in the tasking letter:

- Adequacy of administrative and engineering controls at the Advanced Light Source
  - This area needs improvement.
- Adequacy of the laser safety program
  - This area needs improvement.
- The quality of Laboratory leadership regarding ES&H
  - There are opportunities for improvement.
- The effectiveness of the principal investigator, middle managers and first line supervisors as safety leaders and mentors at the Berkeley Lab for example frequency of walk-throughs and mechanisms for addressing employee safety concerns
  - There are opportunities for improvement.

We believe that the following statements are generally true and that the LBNL "Safety Culture" is generally sound:

1. Unsafe practice is considered unacceptable
2. Everyone feels responsible for safety
3. People go out of their way to identify unsafe conditions and behaviors
4. People intervene to correct unsafe behavior
5. Reminding someone to work safely is appreciated at the Berkeley Lab
6. Safe work practices are supported with rewarding feedback from Principal Investigators (PIs) and operations managers
7. Root causes are determined for all known adverse events, and analyzed for opportunities to improve the system
8. ES&H is NOT just a priority; it is an integral part of what the Berkeley Lab does.

Following is another grouping of our suggestions that we believe will contribute to improved ES&H performance. As a means to reduce the number of suggested actions, each one has been categorized into one of four groups, i.e., Human Resources Polices and Procedures, Education and Training, Communications, and Operational Procedures.

We recommend that you validate our Issues before implementing the Suggestions. And even then, they are suggestions that should only be implemented after full consideration of the consequences. We have made an attempt to understand the breadth of the Issues but had limited time to determine how widely applicable the Issues were.

Implementation of the suggestions in each of the first three groups can be initiated from a top down approach, e.g., position descriptions can be modified to include explicit responsibilities for ES&H activities, safety courses can be required for advancement, and a communications officer can be placed on the staff of the Director.

Human Resources Polices and Procedures represented 13 of the 54 suggestions (1.1.2,1.1.3, 1.1.4, 1.1.6, 1.1.7, 2.1.2, 2.2.1, 3.1.3, 3.2.1, 4.1.3, 4.2.1, 4.2.2, 4.3.1).

- Look into ways of reducing the span of control for PIs by recognizing Post Docs as supervisors and in turn training them for these responsibilities.
- The job responsibilities of the technical safety experts should be expanded to include the obligation to walk the laboratories, observe conditions and to teach PIs how to conduct effective walk-arounds.
- Explicitly reinforce to management the very positive impact of their presence "on the floor" and the value of increased time spent in this activity.
- Introduce quantitative ES&H performance measures for supervisors.
- Move the ES&H performance question to the beginning of the PRD.
- Consider a more detailed and consistent set of position descriptions with respect to ES&H responsibilities of line management and the ES&H support staff across the Laboratory.
- As quickly as possible, stabilize the EH&S Division leader position.
- The qualifications and training for the safety coordinator position should be determined and formalized, similar to the program for the safety liaisons.
- Assure that all employees understand counseling availability and that any barriers for its use (supervisor approval for time off) are minimized.
- Management should review the current staffing levels in radiation, environmental, and industrial safety to more closely match the staffing levels with the group responsibilities and the management's expectations for improved programs.
- Use the safety coordinator in each division as a trained advisor to assure consistent reporting by line management.
- Provide clear training for the safety coordinator for decision-making.
- For leaders and managers, reexamine how many direct reports are reasonable to assure quality in all areas of responsibility.

Education and Training represented 6 of the 54 suggestions (1.1.1, 2.1.1, 3.1.1, 3.1.2, 4.3.2, 8.3.3).

- Develop a training program for PIs to prepare them for their line management responsibilities (sited twice in Suggestions 1.1.1 and 4.3.2).
- Continue to reinforce that peer review activities are for continuous improvement and train inspectors in the craft areas to communicate in a positive, self-help manner.
- Provide mentoring assistance for all lead managers who are expected to walk their workspaces.
- Use the Berkeley Lab Institute to develop a required core set of courses for all Laboratory leadership, managerial and supervisory positions.
- Broadly introduce Human Performance Improvement (HPI) concepts. Which will encourage reporting so that the institution can learn from its mistakes.

Communications represented 11 of the 54 suggestions (1.1.5, 2.3.1, 3.2.2, 3.3.4, 4.1.1, 4.1.2, 8.1.3, 8.3.1, 8.3.2, 9.1.1, 9.1.2).

- Carefully review the implications of phrases used in the reinforcement of ISM at LBNL so the possibility of misinterpretation can be minimized (e.g., "Unsafe behavior is antisocial behavior").
- Confront this issue in communications with employees and make clear management's dedication to fairness and expectation of employee responsibility.
- Make clear statements from all levels of leadership that schedule is always second to safety and have management actions reflect this philosophy.
- Challenge the management and staff with the notion of "all accidents are preventable." If the institution can agree to this notion, consider investigating all incidents for underlying causes/latent organizational weaknesses.
- Management needs to seriously look into ES&H resources and communicate to the employees the rationale for their funding decisions.
- Share proactive experiences more widely. Make lessons learned a standard element of staff/group meetings and develop more effective mechanisms to share between divisions/work groups.
- Formally require a report of the analysis of the leading indicators semi-annually.
- Remind all employees of Director's commitment to the open communication protocol and why that is important.
- Address impact of the focus on statistics directly with highest levels in DOE HQ.
- The raw TRC data should be widely disseminated to, at a minimum, every supervisor/manager and safety professional. The top management of LBNL should also make time to read this, since it is distilled, condensed, and rich with valuable lessons. The recommended perspective should be "what could we have done differently to have prevented this injury from occurring?"
- The Engineering Division has just initiated a program emphasizing the five ISM core functions plus two other ISM statements – "Each employee is responsible for ensuring his or her own safety" and "I am responsible for safety". This focus speaks directly to many of the root causes of TRC injuries during FY05. The Laboratory should consider adopting this program/emphasis across the site. Combining this with Suggestions 2.3.1, 3.2.2, 3.3.4, and 6.1.1 above, the LBNL message will be consistent and positive.

Operational Procedures represented 24 of the 54 suggestions (2.1.3, 2.3.2, 3.3.1, 3.3.2, 3.3.3, 5.1.1, 5.1.2, 5.2.1, 5.3.1, 6.1.1, 6.2.1, 6.2.2, 6.2.3, 6.3.1, 6.3.2, 6.4.1, 7.1.1, 7.2.1, 8.1.1, 8.1.2, 8.2.1, 8.2.2, 8.2.3, 10.1.1). Unlike the other groups, implementation of changes in this group requires a Laboratory-wide effort. The implementation of Principles 5 and 6 of ISM should be revisited Laboratory-wide. The process to identify the hazards involved in the conduct of their duties should be initiated by every employee. This assessment should also include the safety requirements at the interface between positions. Following the assessment, an agreed upon set of safety standards and requirements should be established. This effort should be lead from the top but implement in a bottom up approach.

- Assure that ES&H concerns are not only considered in normal operations but also in facility modification and construction explicitly.
- Ensure that each employee has an effective way to discharge his or her responsibility for safety. This should include a way to provide feedback or seek assistance on workplace safety matters, and if the employee feels the need, to do this without going through his or her line of supervision.
- Consider lowering the thresholds for root cause analysis in the ES&H causal analysis procedure and making it a lab-wide requirement.
- Consider developing in-house causal analysis/root cause analysis expertise that is available as needed.
- Require that all root cause analysis include corrective and preventive actions that are tracked to closure in the Laboratory's Corrective Action Tracking System (CATS).
- Consider lowering the threshold for preparing AHDs and include all significant hazards of the work activity in the AHD.
- Reconsider your standards for compressed gas usage in laboratories relative to the need for detectors (e.g., hydrogen).
- Assure that when a subcontractor is on the LBNL site, the LBNL ES&H standards are enforced.
- Consider forming a work group of operations staff, workers, and EH&S Division personnel to develop a work permit process suited to project/maintenance work.
- Investigate incidents (major, minor, and near-hits) looking for underlying organizational weaknesses. Develop a hazard analysis process that recognizes human error and provide for controls that allow for human mistakes.
- The analysis in the RSC report should be accepted as the product of expert knowledge. The corrective actions should be the product of and responsibility of line management.
- Consider drawing on the experience at other light source facilities to assist in developing enhanced administrative controls.
- Consider adopting the principles of Conduct of Operations to provide structure and discipline in the oversight of research and operations activities on the ALS experimental floor.
- Consider revising the facility hazard inspection program frequency and team makeup consistent with the graded approach.
- Consider having teams periodically inspect other division's workspaces to get the "fresh set" of eyes.
- Organizational stability in the laser safety program should be established as soon as possible. In the meantime, enhanced management attention to resources and oversight may be in order to ensure that program goals are met.
- Consider instituting a uniform work control program that is accessible at the division and activity level to provide the benefits of work planning in furthering ISM and in the resolution of work conflicts.
- Clarify the requirement for personnel listed on the AHD (always current, updated yearly, etc.) and include a review of these documents during the SA process.
- Develop leading indicator metrics for each division to be included in the ISM plan.

- Consider benchmarking with other companies to help develop the metrics suggested in 8.1.1.
- Establish a standard format for division SA plans with a minimum required content.
- Consider changing the IFA to focus on specific program elements horizontally across divisions.
- The SA evaluation criteria development process should be aligned with LBNL strategic objectives.
- Consider instituting a formal system required of every staff member to identify their own personal set of hazards and hazard mitigation actions. It would be helpful to have the supervisor sign off on this, so that hazard mitigation that needs institutional assistance can be recognized. This suggestion is closely related to 5.1.1 above.

Based upon the enthusiasm expressed by employees at all levels to conduct work in a safe environment, buy-in to the suggested approaches, i.e., changes in the Human Resources Policies and Procedures, improved communications, required safety training and Laboratory-wide re-implementation of ISM, seems achievable.

Appendix A

Letter from Ronald A. Nelson to Aundra Richards, January 5, 2006

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OFFICE OF THE VICE PRESIDENT —
LABORATORY MANAGEMENT

OFFICE OF THE PRESIDENT
1111 Franklin Street, 5th Floor
Oakland, California 94607-5200

January 5, 2006

Aundra Richards, Manager
U.S. Department of Energy
Berkeley Site Office
1 Cyclotron Road, MS 90-1023
Berkeley, CA 94720

Re: Draft scope LBNL Peer Review

Dear Ms. Richards:

Pursuant to the regular weekly management meeting between you, Steven Chu and David McGraw, and the letter you sent to me on December 23, 2005, I am sending you this draft scope of work for the Berkeley Laboratory peer review. The peer review is scheduled for January 17-20, 2006 with some follow up work after the one-week on-site visit. The University and Laboratory management agree with you that a series of leading indicators you note in your letter to me provide compelling evidence that a peer review of the implementation and operations of Integrated Safety Management (ISM) at the Berkeley Lab is warranted. The draft scope for such a peer review is enclosed.

The peer review scope is designed to identify root causes for the events mentioned in your letter, identify specific deficiencies in the Laboratory's implementation of ISM, and make any recommendations for any improvements in the execution of a high quality Environment, Safety and Health (ES&H) program the review committee deems necessary and appropriate. It will be conducted by:

. using the expert knowledge and judgment of peer review committee members
. using a graded approach appropriate for the hazard level of the work
. validating the implementation of ISM principles
. using document review, facility walkthroughs and observation, as well as interviews with Laboratory personnel
. using a scoring matrix provided in the scope

This is designed to be a very thorough review. As mentioned above it is expected it will take a week of on-site presence and will include daily outbriefings of Lab management. Any serious safety hazards the committee identifies will be corrected immediately. A formal report will be presented orally at the end of the week on-site with a follow-on written report within two weeks of the review. The review team will receive documentation in advance of the on-site visit. The review team includes ES&H expertise and management expertise from the following individuals:

Tom Gesell, Ph.D
Professor of Health Physics
Idaho State University

James H. Johnson, Ph.D.
Professor of Civil Engineering
College of Engineering
Howard University

Jim Smathers, Ph.D
Professor Emeritus
Radiation Oncology
UCLA

The above three individuals serve on the ES&H Panel of the University of California President's Committee on National Laboratories.

John Cornuelle, B.A. MBA
Director of OPS/COO
SLAC/Stanford

Tom Dickinson, B.S.
Accelerator Safety &
Configuration Control
NSLS/Brookhaven National Lab

Jack Bartley, Ph.D.: DVM
Independent Consultant
Peer Review Committee Vice-Chair

George Goode, Manager
Environmental & Waste Management
Services Division
Brookhaven National Lab

William Bookless, Ph.D
Associate Director, SSEP
Lawrence Livermore National Laboratory
Peer Review Committee Chair

The DOE observer will be:

W. Earl Carnes
Human Performance Improvement Initiative Manager
DOE HQ EH
Germantown, MD

Biographical information on each panel member will be sent to you under separate cover.

If you have any questions, please feel free to contact me.

Sincerely,

for Ronald A. Nelson, Executive Director
Contracts & Administration-Laboratory Management

Attachment: Draft Berkeley Lab ES&H Peer Review

copies:
Steven Chu, LBNL
David McGraw, LBNL
Howard Hatayama, LBNL
Robert L. Van Ness, UCOP-Laboratory Management
Buck Koonce, UCOP-Laboratory Management
John Ahlquist, UCOP-Laboratory Management

Berkeley Lab ES&H Peer Review
January 17-20, 2006

1.0 Purpose

The Berkeley Lab is conducting an Environment, Safety and Health (ES&H) peer review with the aim of improving the operations, implementation and Lab-wide execution of a robust Integrated Safety Management (ISM) system. The Lab is requesting the review at this time because a number of leading indicators are present that may indicate our execution of ISM is not as effective as it was a few years ago. Those leading indicators include:

- Missing our TRC and DART goals for 2005
- Laser safety issues regarding the laser inventory and the correct use of laser interlock systems
- An apparent breakdown of administrative safety controls at the Advanced Light Source (ALS)
- Communication breakdowns between the Berkeley Site Office (BSO) and the Environmental Health and Safety (EH&S) Division.

The peer review is designed to identify root causes for these leading indicators, identify any specific deficiencies in the Laboratory's implementation of ISM and make any specific recommendations for improvement the Peer Review Committee may judge necessary and appropriate. Although the Committee may identify any best practices they observe, that is not the primary purpose of this review.

2.0 Scope

The scope of this review is to use the core requirements of ISM to assess the Berkeley Lab's adherence to ISM guiding principles. In addition, a program elements scoring matrix is available as a guide. The review is being chartered by Dr. Steven Chu, Laboratory Director.

This peer review should be conducted by:

- Using the expert knowledge of its Committee membership
- Using a graded approach appropriate to the hazard level of the work
- Validating implementation of ISM Principles
- Using document review, facility walk-throughs and observations and personnel interviews

3.0 ISM Principles

Guiding Principle #1

Line management is directly responsible for the protection of employees, the public and the environment.

Guiding Principle #2
Clear and unambiguous lines of authority and responsibility for ensuring ES&H requirements are established and maintained at all organizational levels.

Guiding Principle #3
Personnel possess the experience, knowledge, skills and abilities that are necessary to discharge their responsibilities.

Guiding Principle #4
Resources are effectively allocated to address ES&H, programmatic, and operational considerations. Protecting employees, the public and the environment is a priority whenever activities are planned and performed.

Guiding Principle #5
Before work is performed, the associated hazards are evaluated and an agreed upon set of standards and requirements is established which, if properly implemented, provides adequate assurance that employees, the public and the environment are protected from adverse consequences.

Guiding Principle #6
Administrative and engineering controls to prevent or mitigate hazards are tailored to the work being performed. Emphasis should be on designing the work and/or controls to reduce or eliminate the hazards and to prevent accidents and unexplained releases or exposures.

Guiding Principle #7
The conditions and requirements to be satisfied for operations to be initiated and conducted shall be clearly established and agreed upon.

4.0 Issues Requiring Special Focus in this Review

In reviewing the indicators cited in section 1.0 above, it is apparent that several key issues warrant special focus during this review. Some are specific to certain facilities and safety programs, but others are broader and more fundamental to the effective implementation of Integrated Safety Management at the Laboratory. Draft DOE Manual 450.4x (Integrated Safety Management System Manual) will be provided as guidance in addressing implementation of ISM. In addition, a more detailed document (Activity Standards in Health and Safety) that aligns with the principles of ISM is provided as a guide to facilitate the review of the specific facilities and safety programs of interest. We will rely on the experience and expertise of the peer review committee as a basis for evaluating the quality of Laboratory leadership regarding ES&H, the effectiveness of principle investigators, middle managers and first line supervisors as safety leaders and mentors. With regards to Laboratory's safety culture, a number of cultural attributes are offered as a basis for evaluation, but we will rely on the experience and expertise of the committee to provide their insight and recommendations. Should any member of the team observe unsafe practices

needing immediate attention, it is expected that these be brought to the attention of Laboratory management.

At a minimum, ES&H program aspects that require special attention in this review are:

- Adequacy of administrative and engineering controls at the Advanced Light Source
- Adequacy of the laser safety program
- The quality of Laboratory leadership regarding ES&H
- The effectiveness of the principal investigator, middle managers and first line supervisors as safety leaders and mentors at the Berkeley Lab for example frequency of walk-throughs and mechanisms for addressing employee safety concerns.
- The state of the "safety culture" at the Berkeley Lab, evaluated by considering whether the following statements are generally true or not true as descriptions of the Berkeley Lab culture:

    1. Unsafe practice is considered unacceptable
    2. Everyone feels responsible for safety
    3. People go out of their way to identify unsafe conditions and behaviors
    4. People intervene to correct unsafe behavior
    5. Reminding someone to work safely is appreciated at the Berkeley Lab
    6. Safe work practices are supported with rewarding feedback from Principal Investigators (PIs) and operations managers.
    7. Root causes are determined for all adverse events, and analyzed for opportunities to improve the system.
    8. ES&H is NOT just a priority; it is an integral part of what the Berkeley Lab does.